NRC Responses to Public Comments

Japan Lessons-Learned Project Directorate Interim Staff Guidance JLD-ISG-2012-03: Compliance with Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation

(Docket ID NRC-2012-0067)

ADAMS Accession No. ML12221A319
August 29, 2012

I. Introduction

This document presents the U. S. Nuclear Regulatory Commission (NRC) staff's responses to comments received on the Draft interim staff guidance (ISG) document, "JLD-ISG-2012-03: Compliance with Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (draft for public comment)." The Draft ISG was published in the *Federal Register* on June 7, 2012 (77 FR 33780). The public comment period closed on July 9, 2012; however, a late comment submitted on August 13, 2012, was reviewed, accepted as relevant, and is included in this document.

Comment submissions on the draft document are available electronically at the NRC's Electronic Reading Room at http://www.nrc.gov/reading-rm/adams.html. From this page, the public can gain entry into the Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents.

This comment resolution document is also available electronically at the NRC's Electronic Reading Room under ADAMS Accession No. ML12221A319.

The final ISG can be found in ADAMS at Accession No. ML12221A339.

II. Comment Submissions

The NRC received six (7) comment submissions. The NRC-designated identifier for each unique comment submission, the name of the submitter, the submitter's affiliation (if any), and the ADAMS accession number is provided below.

Summary Table		
Name	**Affilliation**	**ADAMS Accession No.**
1. Tom Gurdziel	unknown	ML12177A372
2. Anonymous	unknown	ML12177A373
3. Tom Gurdziel	unknown	ML12180A119
4. Michael A Melton	Westinghouse	ML121850018
5. Adrian P. Heymer	Nuclear Energy Institute	ML121910388

Summary Table		
Name	**Affilliation**	**ADAMS Accession No.**
6. Michael Corradini, Ph.D.	President, American Nuclear Society	ML12192A164
7. David Lochbaum	Union of Concerned Scientists	ML12233A316

III. Public Comments and NRC Response

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
1	15 Month Status Report Short term, long term, near term, far term .... after 15 months, does it matter what words are used? I don't think words are as important as progress. So, where are we? Unloading BWR elevated spent fuel pools We need to be able to act quickly to remove all fuel (and other items) that are in the elevated spent fuel pool of an accident-damaged BWR plant. Action taken to date: None Storing the removed fuel pool items We need an (already constructed) off-site place to store the removed fuel, at least for an intermediate time period. Action taken to date: None	These comments are out-of-scope for JLD-ISG-2012-03.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	Finding the reactor core We need to have equipment available to go into the reactor building and primary containment to locate all corium deposits (shortly after an accident.) Action taken to date: Unknown Providing Off (multi-plant) site AC Electric power We need to determine which U.S. multi-plant sites have inadequate offsite power when all site plants need off site power at the same time. Action taken to date: None Dose Reduction to the General Public and the Environment We need a PRA to determine if initial accident venting of the BWR Mk I and BWR Mk II primary containments will preserve their long term structural integrity so that they can be flooded up (without leaks) and thus the overall dose to the public is reduced. Action taken to date: Unknown (Did you notice that each item above is or would be applicable to U.S. plants?) So, where do you think we are?	
2	The instrument shall operate without regards to the atmosphere above the pool or foreign material in the pool.	The NRC staff agrees with the comment. The effects of the atmosphere above the pool and foreign

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
		material in the pool have been considered. Specifically, the instrument channel must be qualified to operate in an environment consistent with the spent fuel pool at saturation conditions for an extended period, and the instrument channel components must be arranged to provide reasonable protection of the level indication function against missiles that may result from damage to the structure over the spent fuel pool.
3	Unloading the Unit 4 Spent Fuel Pool Has the use of a crane outside the building been considered? The attached sketch shows approximately how this would work. (You just have to draw in the upper part of the boom and rigging, which I am unable to show.) If you can't pick and rotate the load, (which is a small cask with a few bundles of spent nuclear fuel), consider picking the load and walking the crane (and the load) backwards. (We used this walking method to place big fan rotors, (I don't remember: either Induced Draft or Forced Draft), inside two boiler houses just north of New York City in about 1970.) Finding Primary Containment Leaks at Unit 2 Last month it was announced that an inspection would be done at Unit 2 to look for leaks. Has this been completed by the end of the month? What were the results? Will flooding proceed? Thank you, Tom Gurdziel (From recent pictures, it looks like they already have big cranes on site with approximately a 350 ton "sister hook" on one of	These comments are out-of-scope for JLD-ISG-2012-03. TEPCO has initiated their recovery plan following the accident at at Fukushima Dai-ichi, which includes removal of spent fuel from Unit 4. New insights have not been identified in this communication that need to be shared with TEPCO liaisons.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	them.) *Staff note: Please refer to ADAMS Accession No. ML12180A119 to view the drawing attached to the email.*	
4	***A-4. AP 1000 Spent Fuel Pool Instrumentation Guidance*** **A-4-1 Introduction** AP1000 is required to provide reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system, (2) level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred. **A-4-2 Background** The design bases of AP 1000 address many of these attributes of spent fuel pool level instrumentation. The NRC staff reviewed these design features prior to issuance of the combined licenses for these facilities and certification of the AP1000 design referenced therein. The AP 1000 certified design largely addresses the above requirements by providing two safety-related spent fuel pool level instrument channels. The instruments measure level from the top of the spent fuel pool to the top of the fuel racks to address the range requirements listed above. The safety-related classification provides for the following additional design features:	The revisions discussed in this comment have been appropriately incorporated into NEI 12-02, Revision 1.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	• Seismic and environmental qualification of the struments • Independent power supplies • Electrical isolation and physical separation between instrument channels • Display in the control room as part of the post-accident monitoring • instrumentation • Routine calibration and testing **A-4-3 Requirements** AP 1000 is required to address the following requirements that were not specified in the certified design. **A-4-3.1 Arrangement** *Order Requirement* The spent fuel pool level instrument channels shall be arranged in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the spent fuel pool. This protection may be provided by locating the safety-related instruments to maintain instrument channel separation within the spent fuel pool area, and to utilize inherent shielding from missiles provided by existing recesses and corners in the spent fuel pool structure. *Guidance* Protection against missiles should be described, noting the	

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	protection that may be provided by location of the safety-related instruments and their associated connections below the operating deck. Describe the arrangement and basis for why the operating deck provides protection of the level indication function against missiles that may result from damage to the structure over the spent fuel pool. Alternatively, provide description of the features for additional protection that may be provided by the location the safetyrelated instruments to maintain instrument channel separation within the spent fuel pool area, and to utilize inherent shielding from missiles provided by existing recesses and comers in the spent fuel pool structure. **A-4-3.2 Qualification** *Order Requirement* The level instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool water at saturation conditions for an extended period. *Guidance* Provide a description of the instrumentation sensors and their capability to operate in the environmental conditions that they will experience during design basis events, noting that for the AP 1000 design basis conditions include a SBO with steaming in the SFP. The environmental conditions to be addressed should include appropriate consideration for temperature, humidity, steaming, radiation, and seismic activity (SSE) levels where the sensors are located. Provide information to demonstrate the reliability of the instrument under these conditions. Appropriate evaluations should also be provided to	

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	demonstrate the operability of these sensors for indefinite SBO durations. **A-4-3.3 Power Supplies** *Order Requirement* Instrumentation channels shall provide for power connections from sources independent of the plant alternating current (ac) and direct current (dc) power distribution systems, such as portable generators or replaceable batteries. Power supply designs should provide for quick and accessible connection of sources independent of the plant ac and dc power distribution systems. Onsite generators used as an alternate power source and replaceable batteries used for instrument channel power shall have sufficient capacity to maintain the level indication function until offsite resource availability is reasonably assured. *Guidance* Provide a description of the design features provided to ensure continuous power supply to the instrumentation for extended loss of power conditions. The AP 1000 design provides extended SFP monitoring capability with two trains of dedicated class I E DC power supply for at least 72 hours of post accident monitoring. Beyond the initial 72 hours, the response shall detail how the instrument power supply can be met by the use of offsite portable generators with quick and accessible connection points to the existing ac or dc power distribution system and sufficient capacity to maintain level indication indefinitely. The capability to use both onsite and offsite equipment should be discussed as well as the availability of clear guidance for the operator as part of the AP1000 post-72 hours procedures per AP1000 DCD Section 1.9.5.4.	

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	Alternatively, a description of instrumentation powered locally or a local power independent instrument should be discussed. **A-4-3.4 Accuracy** *Order Requirement* The instrument shall maintain its designed accuracy following a power interruption or change in power source without recalibration. *Guidance* As discussed under Section A-4-3.3 ~~in the body of this guide~~, the AP1000 design provides means for continued power supply to the spent fuel pool level instrumentation, relying for the first 72 hours only on class 1E batteries. The power supply can then be extended indefinitely by various means as described in Section A-4-3.3~~in the body of this guide~~. Additionally, the potential impact on temporary loss of power to the level instrument shall be discussed and evaluated in this section including confinnation that the DP cells would not need to be re-calibrated following a loss of power. The instrument should be discussed to address sufficient accuracy during SBO conditions which includes boiling of the SFP water. **A-4-3.5 Display** *Order Requirement* The display shall provide on-demand or continuous indication of spent fuel pool waterlevel. *Guidance* For the first 72 hours, provide details regarding the continuous	

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	display provided in the Main Control Room with power provided by the class 1E batteries. For Post 72 hours, describe the features of the Main Control Room display and use of power supplies described in Section A-4-3.3 ~~in the body of this guide~~. Describe the SFP water level display features. Provide a description of appropriate alarms for low water level. The display requirement may be described by reference to appropriate instrumentation datasheets, specifications, and other relevant documentation. **A-4-4 Programmatic Controls** *Order Requirement* The spent fuel pool instrumentation shall be maintained available and reliable through appropriate development and implementation of a training program. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels. *Guidance* As noted in the background, the safety-related classification of the AP 1000 spent fuel level instrumentation ensures routine calibration and testing of the instrumentation, which maintains the equipment as available and reliable. The training program shall be described to provide training to personnel in the use and the provision of alternate power supplies to the existing ac or dc power distribution system to power the instrument channels consistent with the post-72 hours procedures detailed in DCD Section 1.9.5.4. Implemented procedures consistent with the training program shall be summarized and clarified as part of the response.	
5a	*NRC position in draft ISG*:	The staff considers that the modification to NEI 12-02

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	Section 2.3: In addition to the listed characteristics of what are not spent fuel pools, "water-filled structures within primary containments that contain temporary fuel storage locations" apply to BWR-6 and some PWR designs. Section 2.3: If continuous indication from a single instrument is not able to measure the entire span from level indications 1, 2 and 3, then additional instruments need to be provided. The set of instruments used to measure the full range of indications should be considered to satisfy the requirements for one channel, either primary or back-up. Section 2.3: Indications may be continuous or discrete (i.e. incremental) over the ranges identified in each subsection of Section 2.3, sufficient to provide at least the minimum resolution specified. The minimum resolution specification applies to the separation distance between discrete point indications. The monitoring requirements pertaining to minimum resolution are distinct from the specified instrument channel system design accuracy discussed in Section 3.7. *Industry response*: Changes have been proposed to NEI 12-02 sections 2.3 and 3.7 to address these issues.	in Revision 1 appropriately addresses the staff's concerns and has modified the ISG accordingly.
5b	*NRC position in draft ISG:* Section 2.3.2: EPA-400-R-92-001 Table 2-2, "Guidance on Dose Limits for Workers Performing Emergency Services" apply to the full duration of the emergency. Since workers may be involved in other recovery actions during the emergency, a fraction of the limit (~20%) should be used in establishing a	The staff considers that the modification to NEI 12-02 in Revision 1 appropriately addresses the staff's concerns and has modified the ISG accordingly.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	water level where dose considerations may become important to spent fuel pool recovery actions (i.e., Level 2). References found in Regulatory Guide 1.13 and ANSI/ANS-57.2-1983 apply to normal dose rates and not emergency worker exposure considerations, and should not be used solely to establish level criteria for Level 2. *Industry response:* Changes have been proposed to NEI 12-02 section 2.3.2 to address this issue.	
5c	*NRC position in draft ISG:* **3.1 Instruments** Section 3.1: In addition to the specified design and programmatic elements in NEI 12-02, the instrument channels must be designed, procured, and qualified to resist shock, vibration, seismicmotion, submergence, and a reasonable spectrum of missiles for reliability following beyond design basis external events. Appropriate quality assurance measures should be applied to the procurement, design and installation of the instrument channels to provide reasonable assurance of functionality following beyond design basis external events. The staff considers application of the following measures to the design and installation acceptable in providing this reliability: • all components of the instrument channels are protected against shock, vibration, and seismic motion by one of the following methods: o commercial design and testing for operation in environments where significant shock and vibration loadings are common, such as for portable hand-	The staff considers that the modification to NEI 12-02 in Revision 1 appropriately addresses the staff's concerns and has modified the ISG accordingly.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	held devices or transportation applications o substantial history of operational reliability in environments with significant shock and vibration loading, such as transportation applications o components inherently resistant to shock and vibration loadings, such as cables • all components located less than [5 feet] above the design basis flood elevation for the site are commercially designed for submerged operation or located within sealed conduit commercially designed for submergence assuming a water level [5 feet] above the site design basis flood elevation • all components located outside safety-related structures and away from the spent fuel pool area are protected against missiles and high winds by locating components within trenches or are otherwise protected by location within structures consistent with the site design basis. *Industry response:* Changes have been proposed to NEI 12-02 section 3.1, 3.2, and 3.4 to address these issues	
5d	*NRC position in draft ISG:* Section 3.2: Installation of additional missile barriers is not required; however, consideration should be given to instrument placement so that an instrument is protected from missiles and the possibility that such missiles could be wind driven, or objects falling over or down onto the instruments (as in Category two-over-one criteria).	The staff considers that the modification to NEI 12-02 in Revision 1 appropriately addresses the staff's concerns and has modified the ISG accordingly.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	Industry position: Changes have been proposed to NEI 12-02 section 3.2 to address this issue.	
5e	*NRC position in draft ISG:* **3.4 Qualification** Appropriate quality assurance measures should be applied to all instrument channel components to ensure reliability following beyond design basis external events, including seismic events. The qualification methods, which may include justification based on significant operating history, testing results, or other appropriate means, should apply to the beyond-design-basis initiating event, as well as the potential result of the spent fuel pool remaining at saturation conditions for an extended period. *Industry position:* Changes have been proposed to NEI 12-02 section 3.4 to address this issue.	The staff considers that the modification to NEI 12-02 in Revision 1 does not adequately address the staff's concerns and has provided exceptions to this section in the attachment to the final ISG (ADAMS Accession No. ML12221A339).
5f	*NRC position in draft ISG:* **3.9 Display** Section 3.9: Spent fuel instrumentation readings for SFP level are to be available to appropriate plant staff and decision makers when required. Once required, the location where the display(s) are located should remain occupied or promptly accessible upon demand for reading. *Industry position:* Changes have been proposed to NEI 12-02 section 3.9 to	The staff considers that the modification to NEI 12-02 in Revision 1 appropriately addresses the staff's concerns and has modified the ISG accordingly.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	address this issue	
5g	*NRC position in draft ISG:* Section A-2-2: The overall integrated plan is to provide a level of detail sufficient for the staff to provide a safety evaluation and license specific order to the licensee. Each licensee should provide information at a similar level of detail as that provided in Attachment 2 to satisfy the level of detail necessary for the Integrated Plan. Information in brackets is provided as an example only, and is not intended to describe means of complying the requirements of the order. *Industry position:* Changes have been proposed to NEI 12-02 Appendix A.2 to address this issue.	The staff considers that the modification to NEI 12-02 in Revision 1 appropriately addresses the staff's concerns and has modified the ISG accordingly.
6	The American Nuclear Society (ANS) appreciates the opportunity to offer comments regarding guidance being proposed to implement requirements involved in the three Orders and the 10 CFR 50.54(f) letter referred to in the subject press release. The NRC is issuing the additional guidance to support the regulatory review of actions taken by U.S. commercial nuclear power plants responding to requirements deemed necessary as a consequence of information emanating from the Japanese earthquake, tsunami, and plant damage at four Fukushima Dai-ichi units. The ANS is the premier U.S. technical society and Standards Development Organization (SDO) that is responsible to the nuclear industry for consensus standards on siting, design, operations, analytic computations, emergency preparedness, decommissioning and remediation, and spent fuel and waste	While the NRC fully supports the development and endorsement of consensus standards, the staff believes that a consensus standard may not offer substantial near-term regulatory value for this particular issue because of the limited time period to address and resolve this issue.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	management. ANS is dedicated to all aspects of nuclear technology and is keenly interested in advancing the cause of nuclear safety by bringing the knowledge made available from the Fukushima accidents into its various activities. The Standards Committee of the ANS in particular, through the efforts of its volunteer experts in developing national consensus standards, can improve the effectiveness of NRC endeavors in learning the lessons from Fukushima. The Orders and letter issued by the NRC for post-Fukushima evaluations were subsequently supported by NRC Draft Guidance Documents. The nuclear industry also developed four documents as implementation guidance as follows: 1. A Nuclear Energy Institute (NEI) document on diverse and flexible coping strategies in the context of Fukushima-like events (NEI 12-06), 2. A NEI document that supports the mandates on reliable spent fuel pool instrumentation (NEI 12-02 [Revision B]), 3. A NEI document on performing walkdowns to verify plant flood protection features (NEI 12-07 [Rev. 0]), and 4. An Electric Power Research Institute (EPRI) document that provides guidance on seismic walkdowns (EPRI Draft Report 1025286). In response to the subject invitation to comment on the proposed staff review guidance, the ANS recommends that the NRC give high priority to enabling appropriate nuclear SDOs to convert the technical content of the above mentioned industry documents into national consensus standards. An appropriate platform to pursue such an action would be the Nuclear Energy	

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	Standards Coordination Collaborative (NESCC), of which NRC is a member. The NESCC is co-chaired by the National Institute of Standards and Technology and the American National Standards Institute (ANSI). The NRC has supported the NESCC pursuant to national and policy objectives and has frequently voiced support for consensus standards as ameans of improving the robustness of regulatory documents. It is mentioned in the documents referenced in the subject press release that the interim staff guidance could be converted to more durable regulatory documents such as Regulatory Guides or Standard Review Plan sections. Hence, future regulatory guidance related to the Fukushima incident could then be effectively promulgated in like fashion as national consensus standards. The ANS is an SDO that is accredited under ANSI. ANS standards are widely used within the U.S. as well as internationally in all areas of nuclear science and technology. ANS strongly feels that greater merit must be accorded to voluntary consensus standards in relation to other non-consensus documents. This approach also offers opportunities for "harmonizing" U.S. safety standards with those of international standards-setting bodies such as safety guides issued by the International Atomic Energy Agency and consensus standards issued by the International Organization for Standardization. The approach is also justified by the broader representation of technical capabilities of experts as well as the more unbiased perspectives brought to bear on such standards. The NRC would also be justified to consider the economic factors whereby the professional volunteer efforts (which are an integral part of developing and maintaining	

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	voluntary consensus standards) are made available to the agency essentially at no cost. The other factors to consider include such qualitative factors as equitable representation of diverse views of standards writers and approvers and the attention to detail that is part of the thorough consensus standard comment and balloting process. The NRC should recognize that the processes that pertain to developing a voluntary consensus standard are analogous to the disciplined approach that agencies themselves require in rulemaking. The ANS Standards Committee stands ready to support the NRC's efforts to implement improvements to safety in light of the knowledge gained from the Fukushima events as well as others such as those at North Anna and Fort Calhoun. We consider this as a vital part of the Society's contributions to overcome the challenges posed by the Japanese earthquake and tsunami, the earthquake in Virginia, and the flooding of the Missouri River in 2011. In proposing that the ANS Standards Committee be charged with supporting the efforts to generate consensus standards from the above mentioned NEI and EPRI documents, we acknowledge the need to include representatives from NRC, NEI, EPRI, as well as other interested parties like owners groups, fabricators, vendors, and nuclear facility operators in the working groups constituted for this purpose. We also recognize that other ANSI-accredited bodies (for example, ASME on construction codes and IEEE for instrumentation) would be involved in executing the consensus standards approach to lessons learned and to future regulatory improvements. All nuclear SDOs and standards supporters mentioned above are currently participants in the NESCC. ANS recommends that this vehicle be used to implement cooperative improvements	

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	across the U.S. SDOs and to initiate harmonization with international activities.	
7	I re-read the March 12th order on spent fuel pool water level instrumentation. Attachment 2 lists 9 required design features and 3 availability/reliability attributes for the mandated instrumentation. But I didn't find anything stating that the installed instruments must be operable/functional at all times. I believe that in that absence, the default becomes standard industry practive and regulatory convention. Namely, when a structure, system, or component is required to be operable, its associated power supply, instrumentation, and alarms are also required to be operable. The standard technical specifications for BWR/4s and the plant-specific technical specifications for many BWRs (e.g., Brunswick and Browns Ferry), do not require water level in the spent fuel pool to be maintained above a certain point EXCEPT when irradiated fuel is being moved. Otherwise, this technical specification requirement is not applicable. By extension, when the water level requirement isn't appliable, there's no legal requirement to have water level instrumentation available. Therefore, the SFP water level instruments ordered installed by the NRC can be intentionally disabled by many BWR owners,	The staff agrees with the comment, discussed this with the Nuclear Energy Institute at a public meeting on August 14, 2012, and considers that the modification to NEI 12-02 in Revision 1, Section 3.1, appropriately addresses the concern.

General Comments on ISG		
Comment No.	**Comment**	**NRC Response**
	except during the brief periods of irradiated fuel movements. If so, the ordered solution many fall way short of expectations. I'd not want to explain to an angry Congress why the mandated instrumentation was intentionally disabled for weeks prior to a spent fuel pool incident.	